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PUBLIC HEALTH REPORTS

VOL. 36 JUNE 17, 1921 No. 24

NOTES ON TUBERCULOSIS SANATORIUM PLANNING.[1]

As a first step in the preparation of standard plans for the several types of buildings necessary for the care and treatment of tuberculous patients, the following general requirements should be borne in mind. It is understood that the needs of ex-service men as patients are especially to be considered.

1. Location and Site.

Principal factors.—(*a*) Accessibility; transportation facilities and distance from a center of population. (It is exceedingly important to remember that sites remote from centers of population are inconvenient and costly in the matter of obtaining supplies; also for the transportation of patients to and from the institution on admission and discharge, and, occasionally, for short leaves of absence, or for the visits of relatives and friends. Further, and this is of prime importance, it is most difficult to attract and retain adequate help, professional and general, in isolated places.)

(*b*) The topographical features.

(*c*) The exposure (orientation) and shelter from prevailing disagreeable winds.

(*d*) The climatic conditions.

(*e*) Water and power supply.

(*f*) Soil and drainage facilities.

The possibility of obtaining water and electricity from some municipality or public service corporation, and of connecting the institution with some public sewerage system, are also very important factors, both in first cost and the trouble and expense of maintenance, and should be carefully considered in the selection of a site.

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[1] These notes were prepared by Mr. T. B. Kidner, institutional secretary, National Tuberculosis Association, in order to formulate the results of recent experiences and of a study of the subject by officers of the Public Health Service, as a basis for the design of sanatoria for the care of ex-service men. The accompanying plates present plans for the more essential buildings and a group plan on an assumed site, which are believed to fulfill the requirements set out in the text. The group plan is subject to rearrangement to meet local conditions of sites, and the necessity of providing quarters for a smaller or larger proportion of personnel.

Credit is gladly given to Derby & Robinson, architects, Boston, Mass., for the development of the semi-ambulant type of building for cold climates. The remaining plans were developed in the engineering section of the Hospital Division, United States Public Health Service.

There must be sufficient level space for the buildings; also enough to provide room for the patients to exercise.

Because of the tedious nature of the treatment of tuberculosis, it is of importance that any natural beauties of a site be conserved in laying out the building scheme, as pleasant surroundings are undoubtedly a factor in the treatment of tuberculous patients.

With the several factors of proper water supply, proper drainage, and nearness to a center of population, all present, the ideal site is one on ground slightly above the level of the surrounding country, and rising behind the building area to the north, the northeast, or the northwest, according to the direction of the prevailing disagreeable winds. In a flat country, protection from such winds must be afforded by a belt of trees, preferably, of course, evergreens.

Buildings in which patients are housed should be orientated to face a little to the east of south, except in subtropical localities, where it is better if the patients' quarters are orientated to face the east.

2. Functions for Which Buildings Must Be Provided.

(*a*) Administration: Medical.

(*b*) Administration: General.

(*c*) Patients' quarters: For acute, semiambulant, and ambulant cases, respectively.

(*d*) Service buildings: Dining room, kitchen and bakery, store rooms.

(*e*) Ice plant and refrigeration.

(*f*) Laundry and sterilizing plant.

(*g*) Heating plant.

(*h*) Garage, repair shops, etc.

(*i*) Residences for staff and employees.

(*j*) Assembly hall and recreation.

(*k*) Occupational and prevocational therapy.

In addition to the foregoing, if the sanatorium is isolated from public facilities, there must be included:

(*l*) Lighting plant.

(*m*) Water supply.

(*n*) Sewage disposal system.

Except in large institutions, it is not necessary to provide separate buildings for each of the things enumerated above; in fact, in a small sanatorium they are often provided for in two or three buildings.

In the succeeding sections there is set forth in some detail, for the guidance of the construction section, a description of the requirements of the various units comprised in the list above. While each unit will be described separately, convenient combinations, varying in number inversely as the capacity of the institution, will be suggested.

3. General Lay-Out.

If the site permit, it is convenient to have the main hospital building centrally located, but toward the front of the site; the service buildings should be at its rear, and the quarters for ambulant and semiambulant patients should be grouped about the main buildings. (See sec. 6.) If patients of both sexes are to be treated in the institution, it is convenient to have the men's quarters on one side and the women's quarters on the other, both in the hospital building itself and in the buildings for patients in the semiambulant and ambulant stage. If Negroes are to be treated, similar provision for dividing the groups is necessary.

In sanatoria of all sizes, provision should be made for the progression of a patient from one room, ward, or building to another, as his condition improves. Thus, an acutely ill patient would be housed in the hospital or "infirmary" unit. When he recovers from the acute stage, he becomes what is termed "semiambulant" and is transferred to simpler quarters. Later, as he progresses toward recovery, he is able to take more exercise and becomes an "ambulant" patient, being then housed in still simpler quarters.

This procedure has been found in practice to be very effective in the treatment of tuberculosis patients in an institution. In planning a tuberculosis hospital, it should be borne in mind, therefore, that for psychological reasons, as well as practical considerations, it is most desirable so to arrange the buildings that the patient passes from one building to another as he progresses toward recovery; also, that the accommodation be progressively simpler in type as the patient nears the period of discharge.

There are two important considerations in the location of the heating plant and power house, viz:

(*a*) The facility with which heavy freight (coal, etc.) can be delivered; and

(*b*) The direction of the prevailing winds, so that the smoke from the chimney shall not be carried over the institution.

Storehouses must also be located with reference to the delivery of heavy freight and, of course, to the facility of distribution to the various units.

Residences for staff, nurses, and help should be removed from the hospital buildings proper and should be, preferably, between them and the entrance to the grounds.

Buildings for recreational, occupational, and vocational therapy, and social features should be located in a central position, preferably near the quarters for ambulant patients.

The service building and dining halls should be in a central location, not only with relation to the ambulant patients and others who will use the dining room, but also for the convenient distribution of food to bed-patient units. In cold climates, inclosed passage ways should be provided between the hospital and the service buildings. The quarters for semiambulant patients should also be connected in a similar manner with the main dining hall.

4. Medical Administration.

The medical administration quarters should include:

(*a*) An office for the chief physician.

(*b*) An office, or offices, for the assistant physicians.

(*c*) A general office with vault for medical records, and waiting-room space.

(*d*) A room, or rooms, for the examination of patients.

(*e*) An eye, ear, nose, and throat treatment room with simple surgeon's sink.

(*f*) Minor surgical dressing room with simple surgeon's sink.

(*g*) Dental rooms: Clinic (10 feet by 12 feet per chair) and laboratory; lavatory bowl in clinic; and sink in laboratory.

(*h*) X-ray department: To include machine room, fluoroscopic examination room, dark room, and plate storage room.

(*i*) Pharmacy (bulk drug storage in basement).

(*j*) Patients' waiting room with toilet.

NOTE: (*d*), (*e*), (*f*), (*g*), (*h*), (*i*), and (*j*) form what is, in effect, an out-patient clinic or dispensary and should be grouped so that access to them is direct for ambulant patients.

(*k*) Toilets for staff (both sexes).

(*l*) Laboratory: (*a*) Routine; (*b*) Research.

(*m*) Medical library.

(*n*) Lecture room for training of nurses and others.

NOTE: In large institutions, (*m*) and (*n*) are often grouped in one unit, either in one wing or floor of the medical administration building or in a separate building.

(*o*) Operating room and its auxiliary rooms.

If a tuberculosis sanatorium is located near a general hospital, it is not usual to equip a regular operating room, but merely to provide a room for minor surgical procedures. In places not close to a general hospital, a proper operating suite, equipped for major operations, is necessary.

Where the medical administration quarters are not an integral part of the hospital unit, the operating suite should be located in the hospital.

An operating room should be not less than 15 feet by 15 feet in size. It must be well lighted from the north, the window to extend to the ceiling. Top lighting is sometimes added, but care must be taken to arrange so that no direct sunlight can enter through it at any time of the year.

The best floor for an operating room is smooth vitreous tile, of dark tone, laid with close joints. Formerly, operating rooms were all white, but the best modern practice is not only to make the floor dark, but also to finish the walls dark to a height of 6 feet, the surface material to be tile of a dark green or cool gray tone. The wall above and the ceiling should be of smooth, hard plaster, painted white.

Either in the operating room itself or in a communicating room without a door between, or in an alcove, there should be installed:

(*a*) Two surgeon's scrub-up sinks;
(*b*) One flushing hopper;
(*c*) One instrument sterilizer, with hood and vent; and
(*d*) One standard operating table.

Adjoining, or near, the operating room should be a sterilizing room, equipped as follows:

(*a*) One autoclave;
(*b*) One water sterilizer, hot and cold;
(*c*) One utensil sterilizer; and
(*d*) One instrument sink.

The floor should be of tile, the walls and ceiling painted.

A surgeon's dressing room, located not far from the operating room, is necessary. Equipment: W. C., lavatory, and wardrobe lockers.

If possible, an anesthetizing room should be provided, so that a patient is spared the shock of seeing the operating room.

A preparation room is necessary for the use of the nurses in preparing dressings for sterilization, and performing other duties in connection with the operating department. There should be a nurse's toilet adjoining. The equipment of the room should include:

(*a*) Work table;
(*b*) Open shelves for odd appliances; and
(*c*) Glazed cases for sterile and unsterile goods.

5. General Administration.

In United States Public Health Service sanatoria, the medical and general administration quarters should be in the same building. The administration unit should include:

(*a*) Office for superintendent (medical officer in charge);
(*b*) Office for M. O. C.'s secretary, adjoining (*a*);
(*c*) Office for business manager;
(*d*) General office, adjoining (*c*);
(*e*) Office for head nurse;
(*f*) Conference room;
(*g*) General waiting room; with toilets (both sexes); and
(*h*) Vault for documents.

6. Patients' Quarters.

For purpose of hospitalization, it is usual to divide tuberculous patients into three categories:

(*a*) Those acutely ill—known as "*hospital*" patients.

(*b*) Those who have recovered somewhat and are able to walk to the congregate dining hall for meals, and to the bath room and toilet—known as "*semiambulant*" patients.

(*c*) Those who have progressed still further toward recovery and are "on exercise"—known as "*ambulant*" patients.

It is not possible to state with exactitude the proportion of patients in each category, as it varies in different institutions and from time to time in the same institution.

For the hospitalization of tuberculous ex-service men, it seems advisable that provision for their housing should be made in the following proportions of the total patient capacity:

	Per cent.
Hospital patients, not less than	40
Semiambulant patients	35
Ambulant patients, not more than	25

Types of buildings.—Detailed descriptions of the several types of buildings necessary for these groups will be given later, but it is convenient at this point to set down some general remarks upon the subject.

In good practice to-day, the accommodation provided for hospital patients in a sanatorium differs but little from that of a modern general hospital; the chief difference being that for at least 50 per cent of the patients, provision should be made for open-air sleeping on porches, verandas, etc.

The accommodation for semiambulant patients should be of such a type that in case at any time the number of patients needing hospital treatment exceeds the capacity of the hospital, the excess can be treated in the semiambulant patients' quarters.

For ambulant patients, comfortable living and sleeping quarters of simple type should be provided, and these should include outdoor sleeping facilities for every patient; the buildings, whether of the "cottage" type, with a few patients in each, or of the "congregate" type, in which larger groups of patients are housed in one building, should be arranged to give some privacy to the inmates and not on the open ward principle.

7. Hospital Building.

In good sanatorium practice it is usual to keep all newly admitted patients under observation in bed for a week or two, for diagnosis and classification. Such patients are conveniently housed in the hospital building in a reception division, wing, or ward. This should be located near the point at which incoming patients would most conveniently be received, and comprise approximately 20 per cent of the hospital unit accommodation.

Single rooms are necessary for patients critically ill; also for terminal cases. When a patient improves somewhat he is usually removed to a two-bed room. Later, he is assigned to a four-bed, or six-bed open ward. The following approximate relative proportions for the accommodation in a hospital unit are suggested:

	Per cent.
In a single room	15
In two-bed rooms	35
In four-bed wards	25
In six-bed to ten-bed wards	25
Hospital unit capacity	100

All corridors should be not less than 8 feet wide. All doorways to patients' rooms and wards should be wide enough (3 feet 6 inches) to allow a standard bed to pass through freely. On no account should threshold strips be installed in doorways.

SERVICE ROOMS.

In a hospital unit, various service rooms are required, and are considered in the succeeding paragraphs.

(*a*) *Nurses' duty room.*—On each floor there should be a nurses' office, usually termed a "nurses' duty room." Adjoining it, and preferably entered from the room, should be a toilet and lavatory. The room should be large enough to hold a standard desk, a wall cabinet for patients' charts, a small drug cabinet, a couch, and two chairs. Outside light is necessary.

The American Sanatorium Association Standards of Hospital Administration call for one nurse to each ten hospital patients. Therefore, in addition to the duty room, simple "nurses' stations" should be provided at convenient points on each floor; each for one or two nurses, according to the capacity and plan of the building. An electric "nurses' call" system should be installed in the patients' rooms and wards, with indicator in the nurses' duty room.

(*b*) *Utility room.*—For approximately each 20 patients confined to bed there should be provided one utility room, so located that the minimum of travel is involved for the nurse when carrying utensils from a bedside to the room. Outside light and air are necessary.

The equipment should include:

1. A bedpan sterilizer of inclosed type, with not less than 35 pounds of steam laid on.
2. A small sterilizer for sputum cup containers. (Steam, as above.)

3. A rack for utensils.
4. A lavatory bowl with hot and cold water.
5. A slop sink.

Provision must also be made in this room, or near it, for the disposal of used paper sputum cups, paper napkins, etc., either by providing a local built-in incinerator, or a collecting receptacle. (See note on "sputum technique" under section 9.)

(*c*) *Diet kitchen.*—For approximately each 30 patients confined to bed there should be provided one diet kitchen, so located that trays can be carried to bed patients with a minimum of travel and time. Outside light and air are necessary.

The equipment should include:

1. An ice box, or, preferably, a refrigerator operated from a central refrigerating plant.
2. A hot-plate worktable.
3. A small range, preferably gas or electric.
4. A kitchen sink and draining board.
5. Racks for trays.
6. Shelves for crockery, with drawers for silver and linen.
7. Small sterilizing dishwasher.

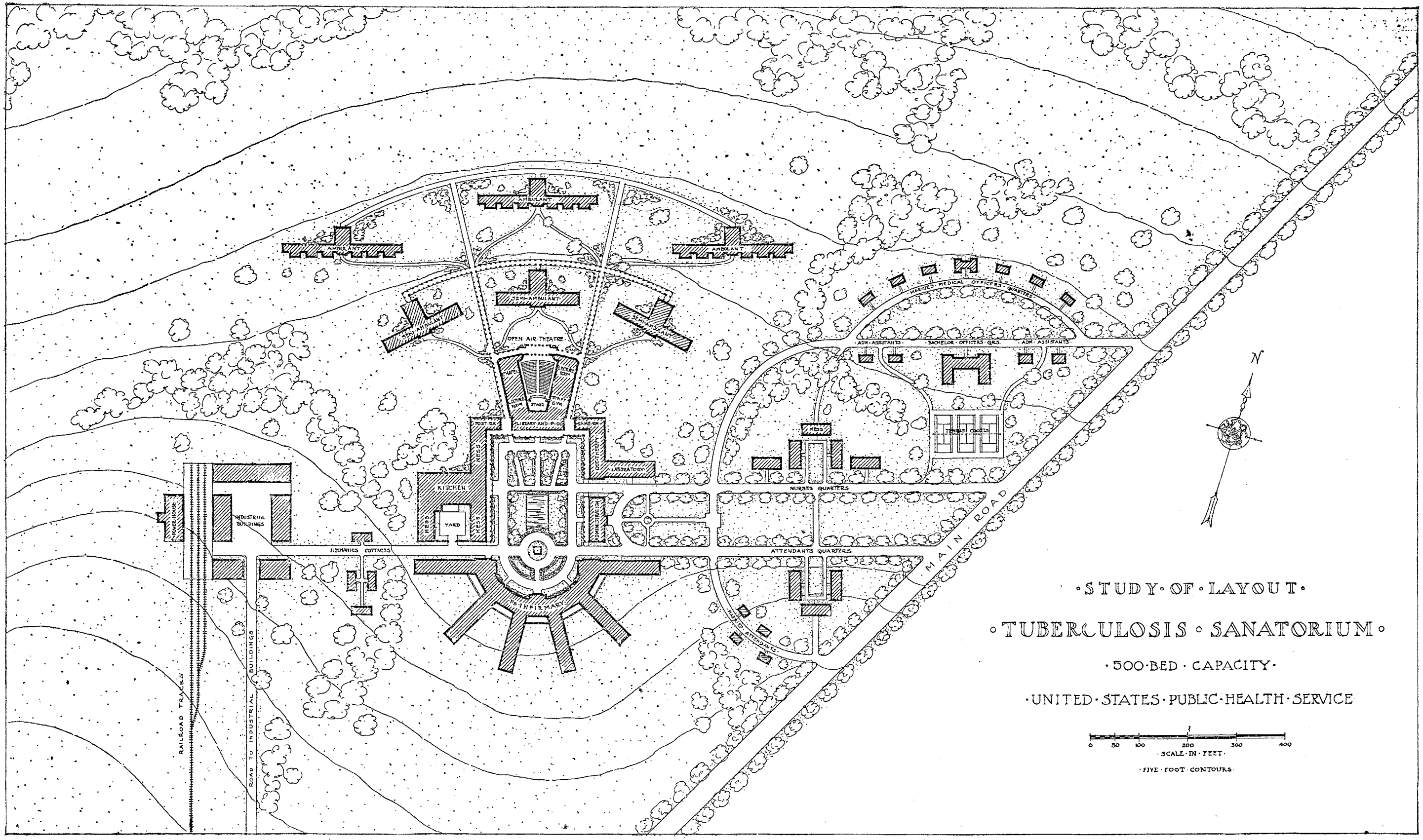
Food is usually brought in heated trucks from the main sanatorium kitchen, direct to individual diet kitchens; but sometimes it is conveyed by dumb-waiter from the lowest floor to the diet kitchens on floors above. In general, a dumb-waiter should be included in all diet kitchens above the lowest floor, unless heated food trucks are to be used.

(*d*) *Dining rooms.*—It has been found helpful to allow hospital patients who are able to leave their beds to proceed (in dressing gowns) to small, local dining rooms for one or more meals daily. Patients appreciate the break in the monotony thus afforded, the effect on their progress is good, and the labor of tray feeding is reduced.

It is well, therefore, to provide, in a room adjoining the diet kitchen nearest to the four-bed and six-bed wards, small dining rooms to accomodate from 10 to 20 patients. (In a large institution several such rooms, appropriately located, may be necessary.)

No fixed equipment is required; but it is convenient to provide a serving hatch in the partition between the diet kitchen and the dining room. Outdoor light and air are necessary.

(*e*) *Linen closets.*—For approximately each 35 patients a linen room or closet, to hold not more than two days' supply, should be provided. The equipment should consist of shelves not less than 18 inches deep in the upper portion; the lower shelves to be about 30 inches deep, the uppermost wide shelf to form the working table. A room six feet square will be sufficient. Outside light is desirable.



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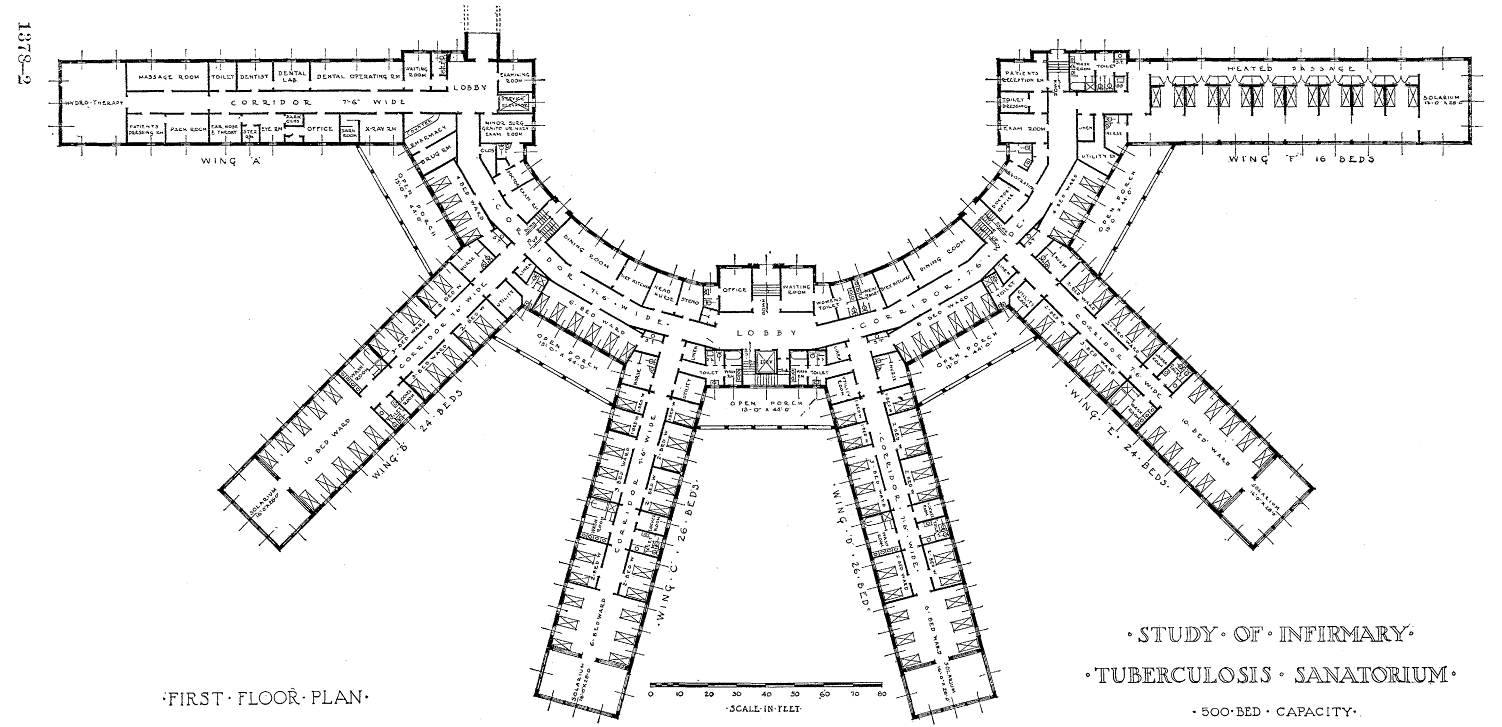

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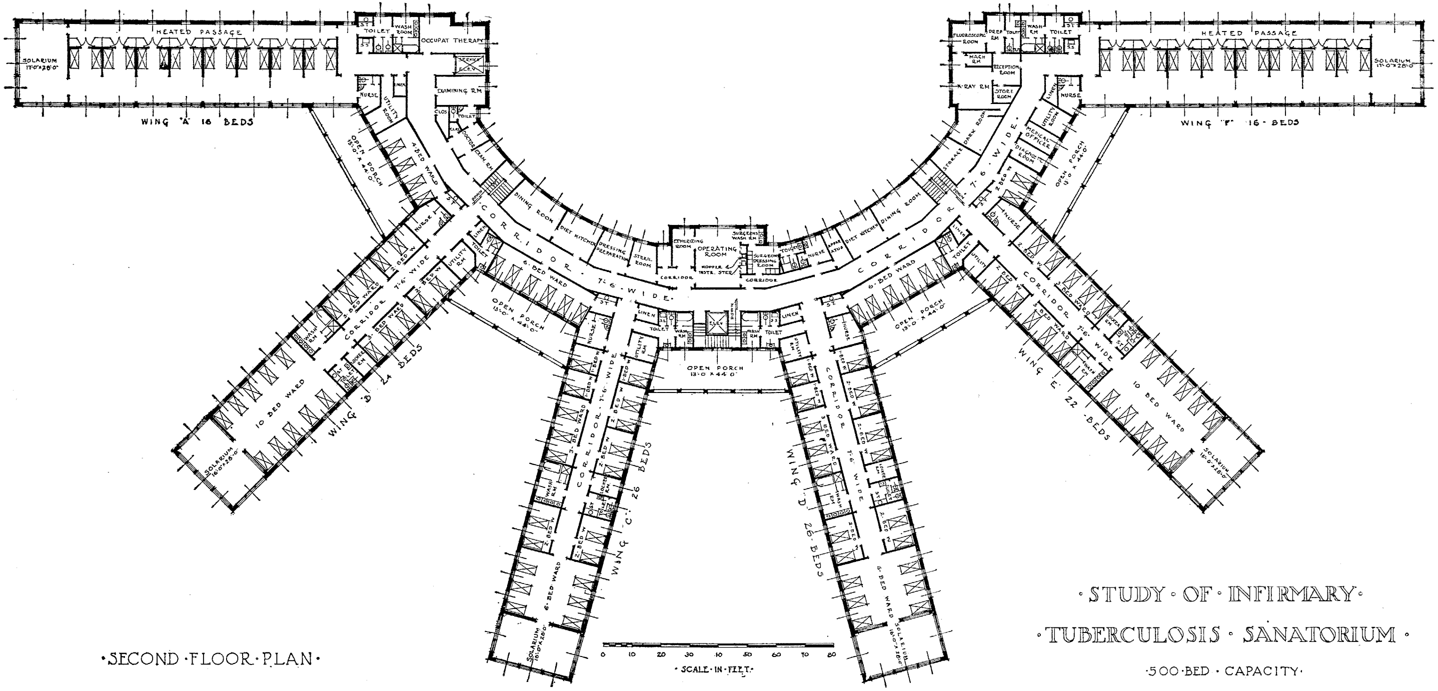

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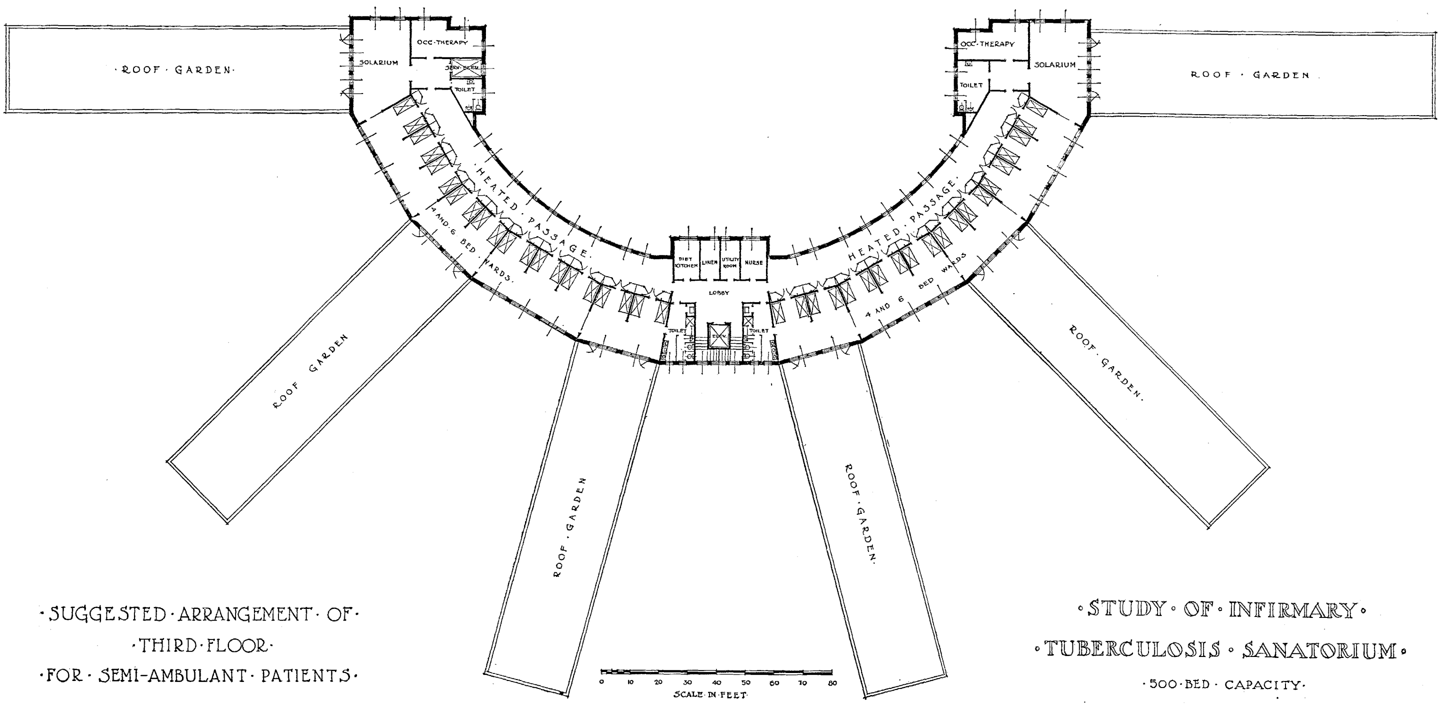

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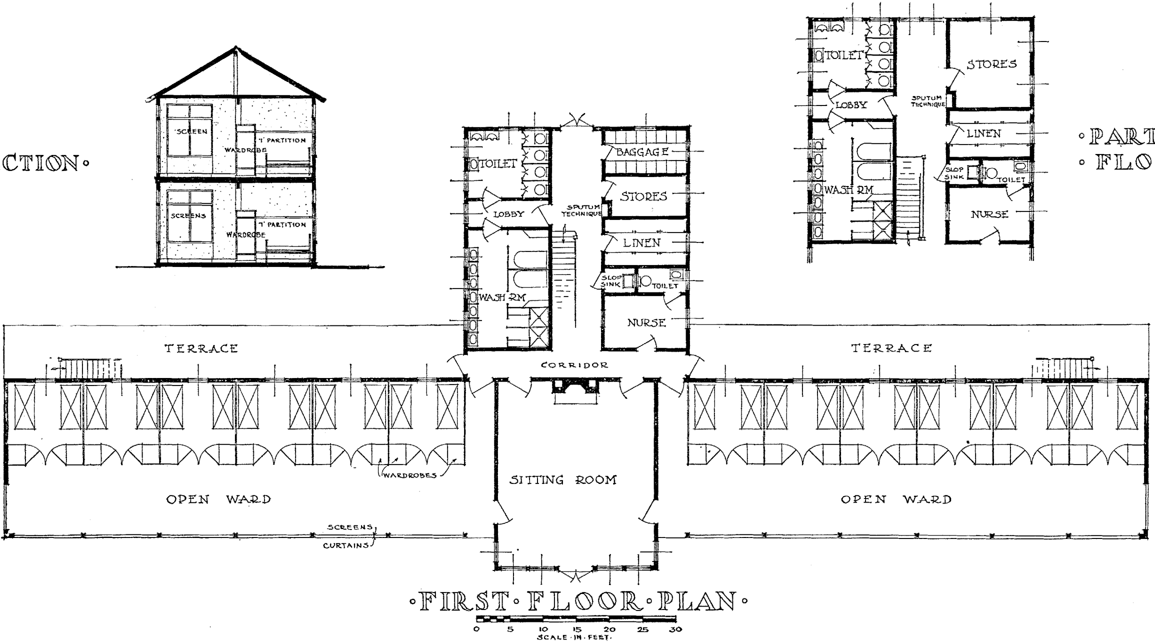

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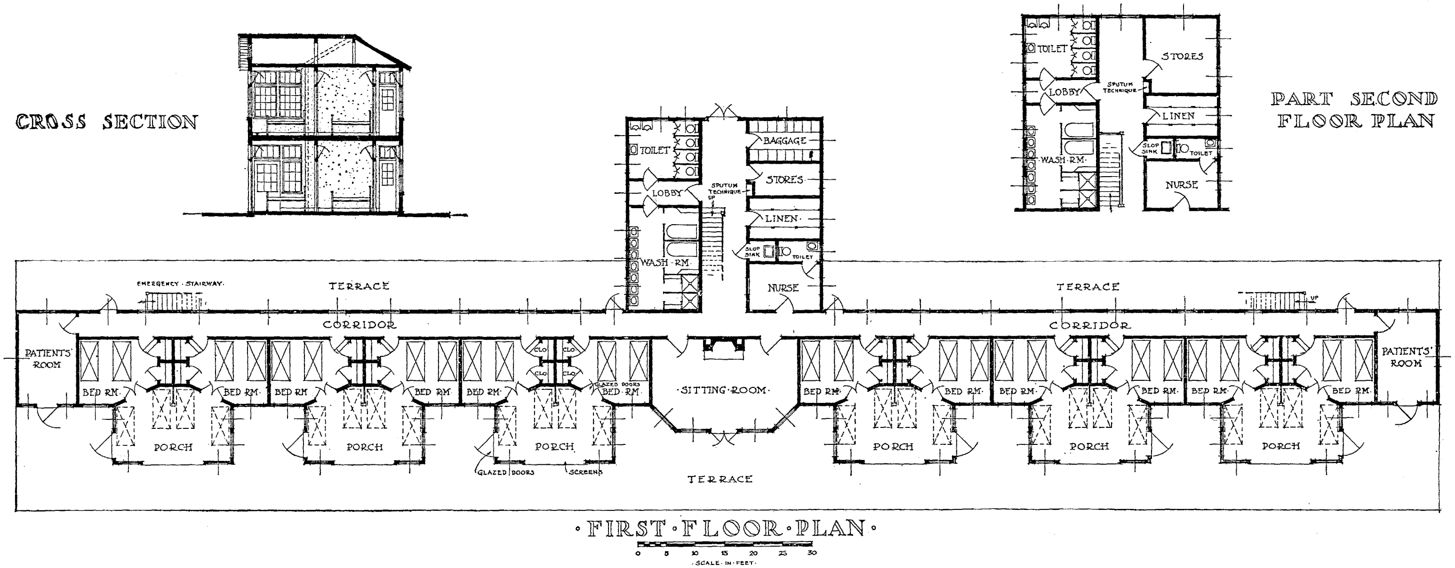

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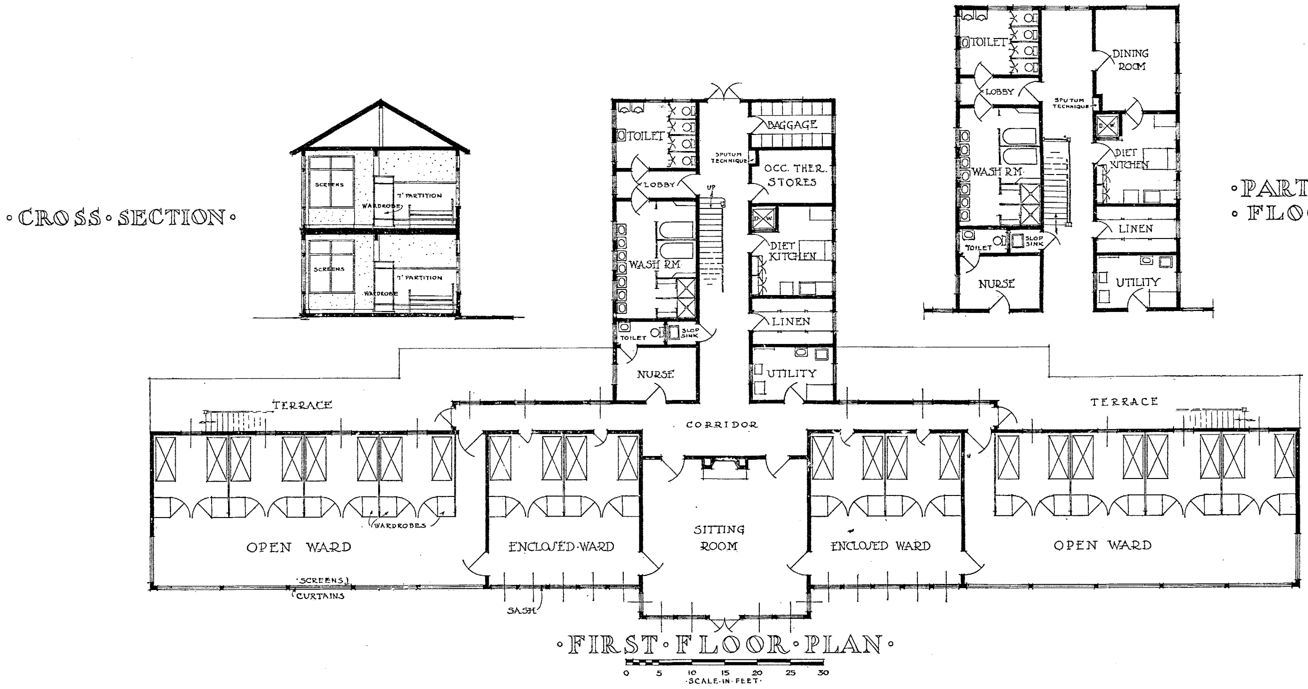

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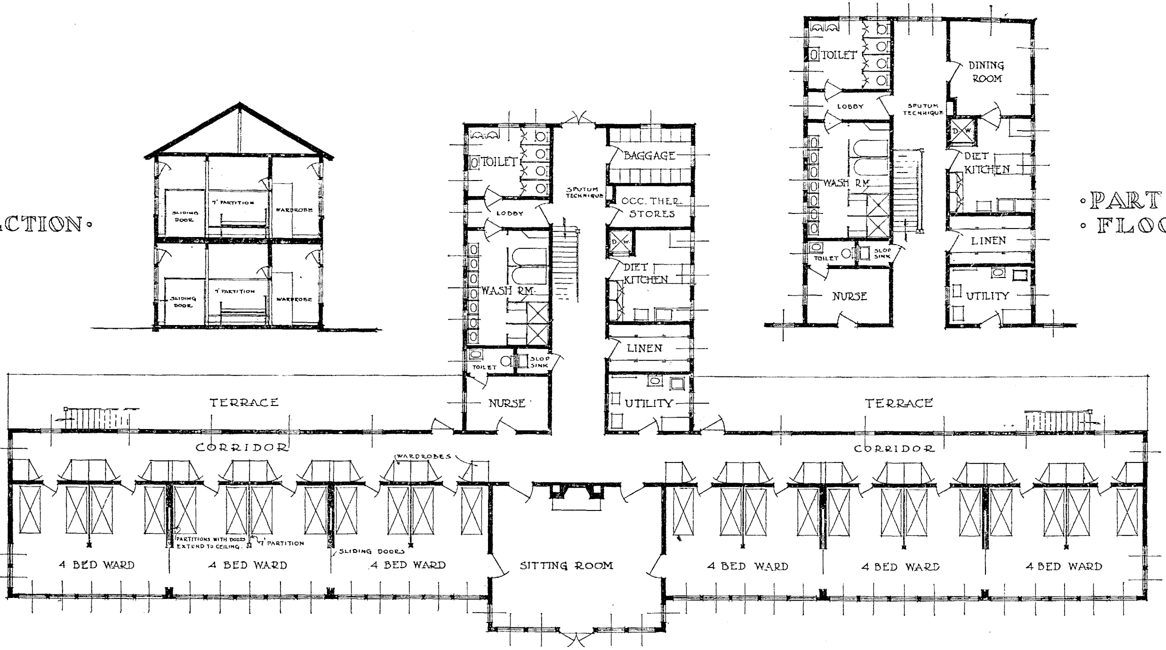
PAVILION FOR SEMI-AMBULANT PATIENTS
WARM CLIMATE

UNITED STATES PUBLIC HEALTH SERVICE



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48 BED CAPACITY

The location should be as central as possible for the beds which are to be served from the closet.

(*f*) *Doctor's office.*—In addition to the chief physician's office (see sec. 4, Medical Administration), there should be at convenient points a small office for the medical officer in charge of a floor, wing, etc., with a toilet and simple lavatory near.

(*g*) *Occupational therapy aide.*—A small room with shelves, similar to the linen rooms, should be provided on each floor, where the occupational aide can keep supplies, patient's work, etc. Theoretically, one such aide is required for each 20 patients; but as acutely ill patients are not able to engage in any occupational work, rooms for the aides need only be provided near the quarters of the patients who are approaching the semiambulant stage.

(*h*) *Patients' toilets.*—For hospital patients, many of whom are confined to bed, toilets in the proportion of one for each 10 or 12 patients will usually be sufficient. Toilet rooms should always be separated from wash rooms, but there should be one lavatory bowl in each toilet room.

(*i*) *Patients' lavatories.*—For hospital patients, lavatory bowls in the proportion of one for each 8 patients will usually be sufficient.

If plugs are omitted from bowls and simple mixing faucets installed, so that ablutions are performed in running water, no dental lavatories need be provided. As the faucet should be rather higher than ordinarily placed, a deeper bowl is advisable.

(*j*) *Patients' baths.*—Shower baths are not suitable for hospital patients. Tubs should be provided in the proportion of one to 15 patients.

(*k*) *Patients' lockers.*—Patients confined entirely to bed require only a standard bedside table with locked cupboard; but as soon as patients are able to walk to the bathroom, etc., a simple wardrobe, in which to hang dressing gown, etc., should be supplied. A storage or check room should be provided, probably in the basement, for patients' suit cases, outdoor clothing, etc.

(*l*) *Janitor's closets.*—Closets for brooms and cleaning materials, equipped with a slop sink, must be provided on each floor.

(*m*) *Elevator.*—In all hospital units of more than one story an elevator large enough to take a standard wheeled stretcher must be provided.

(*n*) *Morgue.*—It is not good practice to include a morgue in the hospital unit. It is much better to locate this in some inconspicuous place near, or in the working buildings, such as the general garage, or, in some cases, the laboratory building in institutions where it forms a separate unit. A room for a mortuary chapel is desirable, but it should not be made a prominent feature of the building group; rather the reverse.

8. Semiambulant Patients' Quarters—General.

A patient is usually classified as "semiambulant" when he is able to dress and go to the main building dining room for his meals. At first this may be the full extent of his exercise, the rest of the day being spent in a cure chair on a porch or in an open ward. Such patients can be conveniently and economically housed in one-story or two-story buildings of the "pavilion type," the sleeping quarters being a modification of the open ward.

At least two types of buildings are required to meet the varying climatic conditions in different parts of the country, which, for convenience, may be termed the "Cold belt" and the "Warm belt," respectively.

Certain general considerations are common to both types:

(*a*) Reference was made in section 6 to the practical impossibility of fixing the relative percentages of patients in the three categories of "hospital," "semiambulant," and "ambulant." For purposes of planning, arbitrary percentages were suggested; but because of the constant variability of the percentages in actual practice, the quarters of semiambulant patients should be so planned that any overflow of bed cases from the hospital proper can be given care in the semiambulant section.

(*b*) If, as occasionally happens, a semiambulant patient suffers a relapse, it should be possible to wheel his cot, at any time of the day or night, into a room apart from the other patients.

Each type must provide for (1) open-air sleeping; (2) individual wardrobe lockers and some privacy for dressing; (3) proper toilet and bathing facilities; (4) nurse's duty room; (5) utility room; (6) diet kitchen, with small dining room adjoining; (7) a day or sitting room; (8) linen closet (day's supply); (9) check or storage room for baggage; (10) janitor's broom closet; (11) space for storage of cure chairs; (12) sputum technique.

(*c*) Units of 20 to 24 patients on one floor are suitable. While variations in detail are numerous, a patient's building of pavilion type usually consists, on each floor, of two wings (open or subdivided, as may be) arranged about a central portion, one ward being on each side of it. The front of the building may be (*a*) straight, (*b*) form a salient angle, or (*c*) form a reentrant angle, somewhat dependent on the site. The service rooms should be on the north side, the sleeping quarters and day room on the south side. (See note on orientation of buildings in warm belt, par. 2, sec. 10.)

(*d*) The most suitable floor surface for the sleeping quarters and the rear dressing corridor is heavy battleship linoleum. Next to that hardwood or rift-sawn (edge-grain) fir is suitable; but it must be finished with good floor varnish, which must be renewed from time to time.

Hard, smooth-finished concrete is suitable for the cross corridor leading to the service rooms and for the rooms themselves. Concrete should not be used for the sleeping quarters and dressing corridors under any circumstances, unless covered with linoleum.

In the following section one floor is described; but the plan of the upper floor is the same, if a two-story building be adopted. If the site permit, the one-story building is ideal for semiambulant and ambulant patients.

In two-story pavilions, the stairs to the upper story should be a straight flight, not less than 4 feet wide in the clear, so that when necessary a patient can be carried down them on a stretcher.

9. Semi-Ambulant Patients' Quarters for Cold Belt.

(*a*) *Sleeping quarters.*—Semiambulant patients should sleep on porches or in unheated rooms so arranged that in effect patients are on a porch. The wings of the pavilion in which the sleeping quarters are located should be not less than 24 feet from front to rear. The front should be almost wholly of glass, with all openings properly screened to exclude flies. The best type of windows for this purpose is one in which the sashes are pivoted on the sides to open outward (of which there are several types on the market), the wire screens being inside. Sashes opening in this way can be kept open in stormy weather longer than ordinary sliding sashes, or casement-type windows, without subjecting the inmates to a direct draft. An upper row of sashes above a transom should be provided with a device for opening and closing (preferably in series at one time) not under the control of the patients.

The beds should be arranged in pairs, with not less than 4 feet 6 inches between them, except as provided in the next sentence. Between each pair of beds a partition should be arranged, against which the beds can be placed, the type of partition varying. To be able to provide for a variable number of bed (hospital) patients overflowing from the hospital, the sleeping space in each wing should be divided by a cross partition into four-bed units. This partition should extend to the ceiling; but that part of it nearest the front should be made to slide or fold, so that the front portion of the wing is open from end to end when none but semiambulant patients are being cared for in it.

Between the center pair of beds in a four-bed section there should be provided a stall partition 7 feet high, 9 feet from front to rear, and 9 inches from floor. A ceiling vent should be provided over each pair of beds.

Toilets should be separated from lavatory and bathrooms by a close partition; there should be one water closet for every six patients. A lavatory bowl should be installed in the toilet rooms.

There should be one tub bath and one shower bath for every 10 patients. Lavatory bowls, one for every four patients. No dental lavatories are necessary if the plugs are omitted from bowls and a simple mixing faucet installed, so that ablutions are performed in running water and the same bowls used without offense for teeth cleaning. (See note (*i*) in sec. 7, "Hospital Building.")

Items (4), (5), and (6) in the last paragraph of subsection (*b*), section 8, are for use only when bed patients are being cared for in the semiambulant unit, and should be similar in detail to the corresponding rooms in the hospital. (Sec. 7, sub secs. (*a*), (*b*), (*c*), and (*d*), respectively.)

The day or sitting rooms should be warm, well lighted, face the south, and be as homelike and attractive as possible.

The linen closet should be as described in section 7, subsection (*e*), and located in the central portion of the pavilion.

The check room should be equipped with batten racks to hold suit cases, etc., in the usual check-room style, the door to be locked and the key in charge of an orderly or nurse.

The janitor's closet should be placed so that it can be reached without entering a toilet room, lavatory, or bath room.

Sputum technique should be provided for by arranging (preferably in the corridor near the entrance to the washroom) a well-lighted, hemicylindrical recess, about 2 feet wide and 20 inches deep, lined and floored with impervious white material. This recess, in which will be placed the containers to receive used cups, should be so located as to be within view of the nurses' station. In a fireproof building a small closed incinerator, such as the Kerner and other well-known makes, can be built into the wall, and the used cups, etc., deposited in it and burnt at intervals.

At the rear of the wings, at grade, a level walk or low terrace should be provided, on which patients can recline in cure chairs in the shade during hot weather.

10. Semiambulant Patients' Quarters for Warm Belt.

There are very few places in the country which are proper localities for the tuberculosis sanatorium where the pavilion described in the previous section would not be quite suitable. In almost every district, on some days and during most nights of the winter months, artificial heat is necessary in the service rooms for all classes of patients. In pavilions adapted for the care of semiambulant patients and also for taking care of an overflow of bed patients from the hospital unit, it should also be possible in cold weather to heat, at least, the sections in which bed patients are being treated.

Reference was made in section 1 (Location and Site) to the orientation of buildings in which patients are housed. Pavilions for semiambulant and ambulant patients in the warm belt should face almost due east, or, possibly, a little to the south of east. The patients are thereby not in direct sunlight during the long daily rest period after the midday meal, which is an important consideration in some districts.

The pavilion suggested for semiambulant patients in the warm belt is a modification of that described in section 9 preceding. The general scheme of a central portion, containing the service rooms and a day room, with two wings for sleeping quarters, is adhered to in the modification. The service rooms are also similar in every respect to those described in section 9, the changes suggested being in the sleeping quarters and dressing corridor. The unit of 24 beds on one floor (12 in each wing) is also unchanged.

The principal change is that the dressing corridor is omitted and the individual wardrobes (P. H. S. Standard) are placed in the sleeping space. From front to rear, the wings should be about 24 feet deep. Longitudinally, the space should be divided by stall partitions into semicubicles 11 feet 6 inches wide, to accommodate two beds each. The stall partitions should be 12 feet 6 inches from front to rear, 7 feet high, and 1 foot from floor. Each cubicle should have a screened window on the rear wall, to provide a through current of air. The front of the wings (except as specified later) need not be glazed, merely screened.

The two cubicles (four beds) nearest the central day room in each wing should be capable of being heated to care for bed patients in an emergency, or an overflow from the hospital unit. An inclosed room should therefore be formed, and an inclosed passageway from the open ends of the wings should be formed at the rear of the room, to afford access to the central portion when the emergency rooms are occupied. The fronts of these rooms should be glazed, either with casement windows or horizontally pivoted sashes, as recommended for pavilions in the cold belt.

Doors wide enough for the passage of a cot should be provided between the inclosed rooms and the open ward; also between the rooms and the day room.

A rear walk, or low terrace, at grade, should be provided at the rear, for reclining on cure chairs in the morning, during very hot weather. Some storage space for the cure chairs should be provided.

11. Ambulant Patients' Quarters for Cold Belt.

Ambulant patients require no nursing and only occasional medical treatment, the chief physical requirement for their care and treatment being comfortable housing, with, of course, a proper regimen of food, rest, and exercise. Therefore, in planning quarters for ambulant patients, while comfort must be considered, provision must also be made for adequate supervision, with a minimum of administrative time and trouble.

As ambulant patients are able to wear ordinary clothing and to walk to the main dining hall, considerable latitude is possible in locating their quarters on the plat plan, inclosed passageways to the service and other buildings being unnecessary.

There is very general complaint on the part of ambulant patients in sanatoria, who are housed in open wards, of the lack of privacy afforded by accommodation of that type. Many sanatorium authorities to-day believe in small units, of the cottage type, for the housing of ambulant patients. It is a matter of economy, however, both in first cost and administration, if congregate buildings are adopted; but it is not difficult to carry out, by internal planning, the idea of the cottage type in which from two to four patients form the unit.

The most convenient type of congregate building for ambulant patients in the cold belt is similar in general plan and arrangement to the pavilion suggested in section 9 for semiambulant patients, but differs in its interior details. If the site permit, the one-story pavilion is more convenient for supervision, but two-story pavilions are quite suitable.

The following features may be omitted from the list of service rooms details, as specified for semiambulant pavilions:

(*a*) Diet kitchen and dining room;
(*b*) Utility room; and
(*c*) Nurses' duty room.

An enlarged linen room will serve for a place in which the nurse may keep the patients' records. The usual nurses' duty room will not be required, as one nurse usually supervises several pavilions for ambulant patients.

In all other details of service rooms the plans for semi-ambulant patients' pavilions in the cold belt should be followed; also the rear corridor should be provided.

The sleeping quarters should be divided into two-patient rooms, with one four-patient screened sleeping porch to serve two adjoining rooms. Every room should have a window opening directly to the outer air and sunlight, and not on to the screened porch.

It should be possible to heat the rooms in extremely cold weather to a temperature of, say, 50° The corridors and service rooms should be capable of being heated to 70°.

The rear walk, or low terrace, should be provided, as indicated in previous sections.

12. Ambulant Patients' Quarters for Warm Belt.

In their general arrangement and plan, the quarters for ambulant patients in the warm belt should be similar to the type suggested for semiambulant patients in section 10, but several details of service rooms, etc., therein suggested may be omitted for ambulant patients, as follows:

(*a*) Diet kitchen and dining room;
(*b*) Nurses' duty room; and
(*c*) Utility room.

An enlarged linen room, as described in section 11, should be provided.

The partitioning of a four-bed unit, capable of being heated, on each side of the central day room, as suggested for semiambulant patients' quarters in section 10 (warm belt), is unnecessary. Each wing should be open from end to end on the front side, and divided into two-bed semicubicles by stall partitions and standard wardrobes on the rear. A screened window, to open, should be installed in rear wall of each semicubicle. No rear corridor is necessary; but a rear walk, or low terrace, as described in previous sections, should be provided.

13. Dining Halls, etc.

The service buildings, including dining rooms, kitchen and bakery, store rooms, etc., necessary for a tuberculosis sanatorium, do not differ materially from similar rooms in a general hospital.

In civilian sanatoria, it is not usual to separate the sexes in the main dining hall. If Negroes are in an institution, a separate dining hall, but served by the main kitchen, must be provided.

Nurses, occupational therapy aides, and other female employees of similar grade, should dine together in a separate hall in large institutions. A separate dining room for doctors should also be provided. Male employees, such as office men, laboratory workers, etc., should also dine together.

Other grades of male and female help should be provided with separate dining rooms.

(NOTE.—In planning service buildings, standard lists of personnel are necessary, and should be furnished to the construction section.)

In arranging the patients' dining room, provision should be made for the adoption, if advisable at any time, of the so-called "cafeteria" or selfservice plan, which is now being employed successfully in a number of sanatoria.

14. Other Service and Working Buildings.

In section 2, subsections (*e*), (*f*), (*g*), and (*h*), other service buildings were named, but no description seems necessary, as they do not differ materially from those provided for similar functions in a general hospital.

15. Residences for Staff and Employees.

Reference was made in section 13, to the need for a list of employees for standard sanatoria of given sizes, in order that proper dining-room accommodation may be planned. Such a list is very necessary for the proper planning of residences for the staff and employees.

Some guidance is afforded by the standards for sanatorium administration recently issued by the American Sanatorium Association. In these standards, the number of assistant physicians necessary for a Grade A sanatorium is one for each 50 patients, up to 150 patients, and one for each 75 patients above that number. In addition, there are usually some physicians employed in the laboratories and other departments in large institutions.

For nurses, the American Sanatorium Association Grade A standards call for one to each 10 bed-patients; but it is safe to consider one to each 10 patients throughout, as provision must be made for leave, sickness, etc.

Occupational aides are generally estimated in the proportion of one for each 20 to 25 patients, the latter proportion being probably a safe estimate on which to base housing plans.

16. Laboratories.

A. X-RAY LABORATORY.

Because the application of the X-ray in the diagnosis of tuberculosis has only become general in very recent years, the X-ray laboratory has often been housed in unsuitable rooms, and the space allotted has usually been insufficient for proper work.

An X-ray laboratory (or suite, for several rooms are required) should not be located in a basement, or in any other position which is likely to be damp. In general hospitals, an X-ray laboratory is often located near the operaing suite. In a tuberculosis sanatorium, it should be so located as to be easily reached by all classes of cases, particularly by those who must be wheeled to it. (See subsections (*d*) to (*j*) in section 4, preceding.)

The several units for which provision must be made are:

(*a*) An "operating" room, including fluoroscopic work;

(*b*) Dark room;

(*c*) Machine room;

(*d*) Office and plate filing room; and

(*e*) Waiting room.

In a large institution (say 600 to 1,000 beds), a further subdivision should be made, a separate room being provided for fluoroscopic work, and a filing room for storage of exposed plates, which are kept for record and reference.

(*a*) An operating room should be not less than 12 feet by 16 feet, with a minimum ceiling height of 12 feet, to allow of head room for the operator below the aerial system. An outside window is necessary; also a foul air vent in the ceiling or high up in the wall.

Artificial light should be provided by a ceiling outlet, and there should be a wall switch and two or more wall outlets, of 10 amperes capacity. The walls should be lined to a height of not less than 7 feet with 4-pound lead.

In small institutions the operating room is used also for fluoroscopic examination, shades of opaque material, to run in deep boxes inside the window frames, being provided to render the room absolutely dark. In large institutions a dark room for this purpose, apart from the operating room, should be provided. Ventilation must be provided. The size of the room should be about the same as that of the operating room. Artificial lighting should also be the same as in the operating room.

(*b*) The dark room for developing plates should be near the operating room and should not be less than 8 feet wide and 12 feet long.

A labyrinth entrance is best. On one long side of the room there should be installed a kitchen sink, 30 inches, with hot and cold water laid on, the spigots to be not less than 24 inches above the bottom of the sink. Adjoining the sink, a lead-lined tank should be installed to accommodate three standard developing tanks, the latter being usually of enameled iron, 14¾ inches square and 20 inches deep. The lead-lined tank should be about 24 inches deep and 22 inches wide, inside measurements, so that a circulation of water about the developing tanks can take place. The tanks are flanged on the upper edges, to rest on a board on each side of the top of the large tank. Hot and cold water must be laid on to the large tank, with the outlet near the top. The top of tank should be about 3 feet from the floor.

The rest of the space on the side of the room should be fitted with a working shelf, which should also be returned across the end of the room farthest from the door. Height of shelf, 3 feet from floor; end of shelf near sink to rest on sink to form draining board.

A drying chamber is a great convenience where many plates or films are handled, and consists of an inclosure, about 30 inches square and 6 feet high, in the corner of the developing room. A small electric fan should be installed on the floor, and a metal duct, extending from the top of the chamber to a flue or other outlet, provided.

Loading room.—In a large institution, a small, separate "loading room," about 5 feet by 8 feet, in which unexposed plates can be stored and the plate holders loaded, is a great convenience. Such a room should adjoin the operating room and be absolutely light tight. To prevent any possibility of rays passing through the partitions or walls forming the room, it should be lead-lined, or the plates may be ruined. Two electric outlets should be provided; also some ventilation.

Machine room.—The machine room should open off the operating room. Size, about 6 feet by 8 feet, with 12-foot ceiling. Outside light is desirable. The walls should be lined with 4-pound lead.

Office.—An office for the chief roentgenologist is necessary. Size, about 10 feet by 12 feet.

Interpretation and filing room.—A room about 12 feet by 18 feet, well lighted by windows, is required for filing current plates, and for their examination and interpretation. One long side should be occupied by a shadow box and the opposite wall should be fitted with shelves and divisions for filing plates. The equipment usually includes, in addition, a stereoscope table, a plain table, and a typewriting desk. Elsewhere in the building there should be space for storing "dead" plates.

Waiting room.—A waiting room, say 12 feet by 16 feet, should be provided. Adjoining it, or opening from it, should be a couple of curtained recesses to form dressing rooms. A toilet room is also convenient. (If women patients are included in the institution, separate waiting, dressing, and toilet rooms are, of course, necessary.)

In general, it is well to arrange the office, waiting rooms, filing room, etc., together, the operating room, developing room, etc., being also grouped.

In a large institution a small office for a clerk or orderly, who receives patients and keeps a card index and other records, should be located adjoining the waiting room.

B. GENERAL LABORATORIES.

The analysis of sputum, urine, etc., as an aid to diagnosis, forms a part of the routine of all tuberculosis sanatoria, and proper laboratory accommodation must be provided for this work.

In addition, every important sanatorium carries on more or less research work. In a sanatorium operated by the United States Public Health Service it is to be assumed that research will form an important part of its functions.

Two laboratories should therefore be provided—one for routine work, the other for special tests and research. The laboratories and the necessary auxiliary rooms may be located in a wing of the hospital building, but in a large institution it would be better if they formed a separate unit. There is reprinted here as an appendix an article by Dr. E. R. Baldwin describing a modern laboratory for a small tuberculosis hospital, which may well serve as a basis for planning a laboratory for a large institution. Such a laboratory should include two or three units of worktables and other equipment in proportion. North light should be provided in these laboratories.

The auxiliary rooms should include an office for the chief laboratory technician; a storeroom for supplies, preferably located between the two laboratories; toilets for both sexes (female laboratory assistants are often employed); a lecture room in which internes, nurses, etc., may be assembled for instruction; and medical library and reading room.

The sanatorium morgue may also be conveniently included in the laboratory building, but a separate entrance should be provided in as inconspicuous a position as possible. The morgue should include cold storage for bodies, an autopsy room, and a toilet and dressing room for the physicians. A small chapel might also be included in the building.

17. Community Building.

Organized recreation and social work are now recognized as essential factors in the conduct of a modern sanatorium, and should for convenience be centered in one unit, usually termed the "community buildings."

Such a building should include an assembly hall for religious services, concerts, entertainments, addresses, and moving pictures. The capacity of the assembly hall should be about 40 per cent of the bed capacity of the sanatorium, plus about 50 per cent of the total number of employees. It is usual to arrange a gallery for nurses and other women employees.

The patients' library, with quiet rooms for reading and writing, should also be placed in this building.

It is usual to employ an officer to take charge of the recreation and social features, this duty being not only to provide certain forms of regular entertainment, but also to organize and regulate for the commanding officer the various voluntary efforts of this kind offered by outside agencies. This officer should be provided with an office in the community building. If a social-service unit is maintained in the sanatorium, the head of the Service should also have her (or his) office, with room for necessary stenographic help, in this building. If the American Red Cross or similar nongovernmental agencies have representatives in the sanatorium they should also be given office accommodation in the community building.

The community building should be located in a central position for ambulant patients.

18. Occupational and Prevocational Therapy.

While much of the work of occupational and prevocational therapy is carried on in a sanatorium in the wards and on the porches, especially in the semiambulant patients' quarters, it is necessary to provide a center for this work to which an ambulant patient may go when his condition permits, and from which the work may be directed.

In small institutions, the occupation therapy center or "vocational building" (as it is sometimes termed) is usually combined with the community building, but in large institutions a separate unit is usually arranged.

VOCATIONAL BUILDING.

In considering what accommodation is necessary for occupational activities in institutions devoted to the care and treatment of ex-service men, the fact must be borne in mind that under the provisions of the Vocational Rehabilitation Act many of the men, before leaving the sanatorium as arrested cases, enter upon courses of pre-vocational education, leading to subsequent vocational training for some new occupation. Such work is also of value in helping to harden patients physically while they are still under medical supervision. Provision should therefore be made in a sanatorium not only for the work which is given for therapeutic purposes, but also for prevocational work which will lead to or form an introduction to specialized instruction after a man leaves the institution.

Accommodation required.—Until a man reaches the fully ambulant stage, practically all the occupational therapy work can be done either in the wards or on the porches, in the hospital, and semiambulant patients' quarters. It is convenient, therefore, to have a store closet for materials or, better still, a small room on each floor of the hospital building and in each of the pavilions for semiambulant patients. Beyond that, an office for the chief aide, a storeroom for supplies, and a room with a bench or two where work done on the wards can be finished will usually meet the needs of the work which is given to patients who have not reached the ambulant stage.

For patients who have reached the ambulant stage, a much wider range of work can be undertaken. Various rooms are required, and there is need for special quarters in what may well be termed a "vocational building."

Broadly speaking, the work may be divided into classroom subjects and shop work. The classroom subjects will vary scarcely at all in different parts of the country, but the shop work may be supplemented or varied by gardening and agricultural work where climatic and other conditions permit.

The exact number of rooms to be planned will depend upon the size of the hospital, but provision should be made so that at least 75 per cent of the ambulant patients can be accommodated, either in classrooms or shops, at one time. It may be considered that this is high, but it must be remembered that the hours of "exercise" are limited; also, that semiambulant patients nearing the stage of full exercise are often directed by the physician to take periods in the classes or shops.

Suggestions for rooms.—Administration:

(*a*) An office for the chief aid; say, 10 by 12 feet.

(*b*) A storeroom for materials; say, 10 by 12 feet.

(*c*) A room for finishing (assembling, varnishing, dyeing, enameling, etc.); say, 12 by 18 feet.

(*d*) An office for the vocational director; say, 10 by 12 feet.

(*e*) A storeroom for stationery, books, and other supplies for academic classes; say, 6 by 12 feet.

(*f*) A storeroom for shopwork supplies; say, 10 by 25 feet.

(*g*) Toilet rooms for male and female instructors.

(*h*) Toilet rooms for students.

Classrooms.—Because of the individual nature of the instruction, classes should not exceed 16 students. The floor space should provide not less than 35 square feet per student; thus a room 20 by 28 feet would accommodate 16 students. The room should be lighted on one of the long sides, with windows of the side-pivoted type preferably, the light to come from the left of the students. The radiation should be installed below the windows, and a foul-air vent arranged either in the ceiling or high up in the opposite wall. Standard blackboards of slate (or, in temporary construction, of hyloplate) should be installed on the wall at the rear of the teachers' desk and on the wall facing the window. A sink for washing blue prints should be installed in the drafting room; size, about 18 by 30 inches.

Generally, four branches of study should be provided for:

(*a*) Academic.

(*b*) Typewriting.

(*c*) General commercial.

(*d*) Mechanical drafting.

Provided that properly deadened floors are installed, the classroom may be in the upper story of the building in which the shops form the ground floor.

Shops and laboratories.—While suggestions will be made as to sizes of units, it is well to arrange that the interior partitions be of light construction and installed in such a manner that they may easily be moved should changes be necessary.

Factory-type windows are desirable and they should extend to the ceiling. At least 50 per cent of the sashes should be capable of being opened, preferably horizontally, on side pivots. Light on two adjacent sides of the room is desirable and the window-glass area should be not less than one-fourth the area of the floor space.

Each unit should accommodate from 10 to 12 students and should provide not less than 150 square feet of floor space for each student. The floors should be of heavy groove-and-tongue batten or wood block. Ceiling should be not less than 13 feet high.

The following are typical of the subjects often given in shops in a sanatorium for tuberculous ex-service men:

(*a*) Watchmaking, jewelry, engraving, etc.

(*b*) Tailoring.

(*c*) Shoemaking (provide for a 5-horsepower electric motor).

(*d*) Commercial art.

(*e*) General technical shop or laboratory, used for arts and crafts work of more advanced type than is possible in bedside and ward occupations; also for "try-out" work in cases where the indications as to a student's capacity, inclinations, etc., are not clear. (Provide for a 10-horsepower electric motor.)

In sanatoria in which gardening, agriculture, and other outdoor work form a part of the active features of the vocational classes, it is probable that shoemaking or tailoring or both would be omitted. Instead, a laboratory for science related to the outdoor studies would probably be installed.

In each workshop water should be laid on and a kitchen or other working sink installed.

APPENDIX.

Laboratories for Tuberculosis Sanatoria or Hospitals.[1]

By EDWARD R. BALDWIN, M. D., Saranac Lake, N. Y.

The necessity for laboratory facilities in tuberculosis institutions hardly needs comment. If situated in isolated places the need for bacteriological and pathological examinations close at hand is naturally greater than in a city hospital. In both there should be available modern facilities at least for the essentials. In order to make a practical work place containing a reasonably complete installation the accompanying plan is suggested. It provides the following features:

1. Bacteriological equipment.
2. Chemical equipment.

Requirements for the first are microscope, incubator, sterilizer, centrifuge, sink with drain board, work table with drawers, and a wall case for glassware and books, with cupboard underneath.

For the chemical work and sterilizing, a hood is indispensable and a separate table desirable. A refrigerator should be provided

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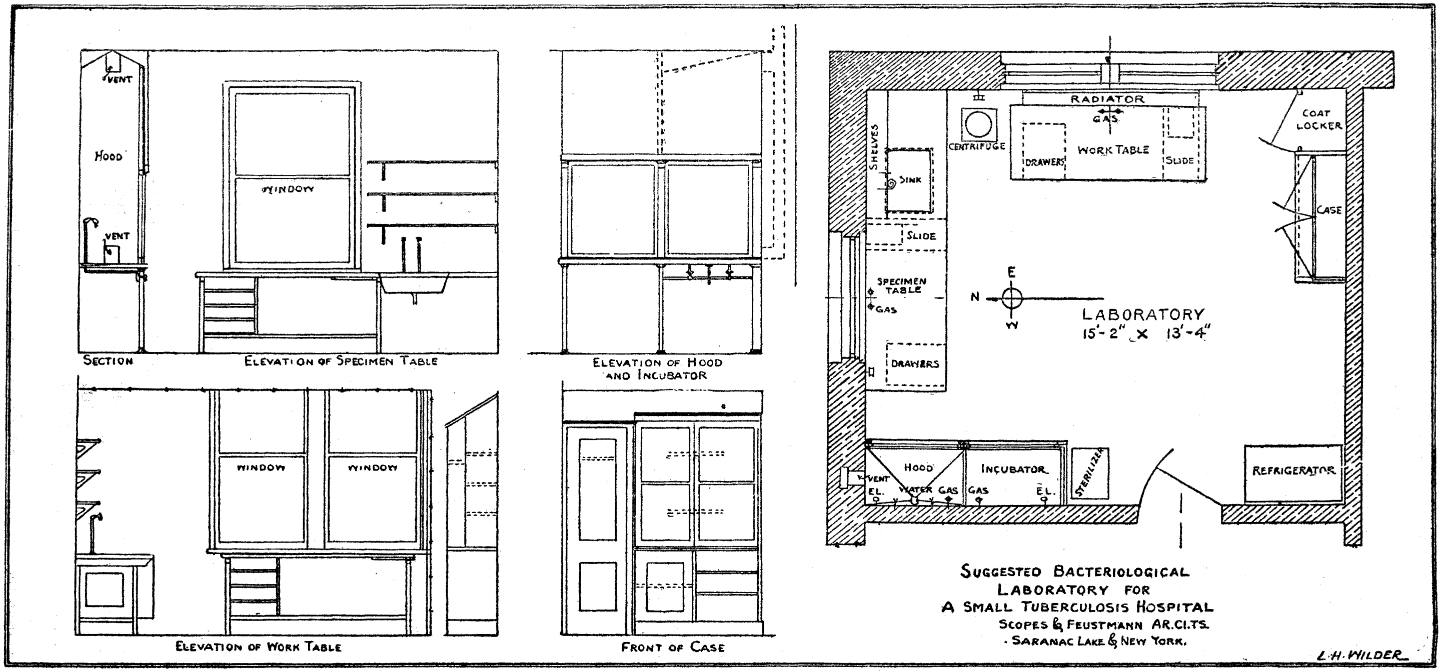
[1] Reprinted from the Journal of the Outdoor Life, December, 1918.



A SUGGESTED PLAN FOR A SANATORIUM LABORATORY.

or accessible. Some wire cages for guinea pigs and white mice could be kept in the laboratory, although preferably in a warm basement. Other furniture suggests itself, such as wall shelves convenient to the sink; also coat hooks or a locker.

When gas is not accessible, a gasoline or kerosene vapor stove may be used in the hood for sterilizing; and very good electrical appliances are to be had for heating the incubator and of course for operating the centrifuge. Alcohol lamps are objectionable on account of the fire hazard, but are more convenient than gasoline torches if gas can not be had.

The sink and water taps should be near the specimen table for convenience in routine sputum and urine examinations.

With the arrangement indicated on the plan almost any diagnostic laboratory work could be undertaken, such as the search for tubercle bacilli in any secretion, blood and throat cultures for pneumonia, typhoid and diphtheria, tuberculosis complement fixation tests, and chemical and microscopic tests of the blood, urine, or pathological fluids. Inoculations of animals for diagnosis can readily be made; and, if desired, pathological specimens can be made with a little more equipment.

As to equipment, the following list of apparatus, chemicals, and glassware for routine sanatorium is suggested:

Microscope, with three objectives, $\frac{1}{4}$ inch, $\frac{2}{3}$ inch, and $\frac{1}{12}$ inch, and two oculars, 5x, 10x.
Hemocytometer.
Hemoglobinometer.
Centrifuge, water or electric, 4 arms to hold 15 c. c. tubes.
Thermostat, gas or electric heat, with regulator and thermometer, 12 by 18 inches.
Autoclave, 11 by 24 inches.
Sterilizer, steam, copper, small Arnold.
Sterilizer and stand, hot air, iron, small.
Coagulator or serum tube inspissator, small.
Water bath copper, 8 inches.
1 ring stand, rings 3 inches, 6 inches.
1 burette holder, 2 clamps.
2 bunsen burners, 1 wing top, 1 gauze top.
1 gas stove, for hood.
1 agate double boiler, 1 quart.
1 agate single boiler, 1 gallon.
2 agate trays, 12 by 9 inches.
1 agate funnel, 6 inches.
4 wire guinea-pig cages, 12 by 18 inches.
6 wire baskets, circular, 5 by 6 inches.
1 test tube support, copper circular, 24 holes, 6 inches.
2 test tube supports, wood, 12 holes.
1 test tube and flask support (wall) wood, for drying.
2 test tube holders, wood.
1 funnel support, wood.
6 test tube brushes, small.
1 potato cutter.
1 Enterprise meat cutter, small.
1 balance and weights, 0.1 gm. to 100 gms.
1 water still, Jewell or Barnstead.
Instruments:
  4 wire slide holders.
  2 cover slip forceps.
  1 pair steel shears, 10 inches.
  1 pair nickelled scissors, blunt, 6 inches.
  1 pair nickelled scissors, blunt, 4 inches.
  2 pairs nickelled thumb forceps, 5 inches.
  1 pair nickelled thumb forceps, 3 inches.
  2 small scalpels.
  3 glass barrel syringes, 1 c. c.
  2 glass barrel syringes, 10 c. c.
  1 glass barrel syringe, 20 c. c.
  6 three-cornered files, 3 inches.
  1 flat file, 6 inches.
  1 pair wire cutters and pliers, 6 inches.
  1 steel spatula, nickelled, 6 inches.
  1 steel spatula, nickelled, 3 inches.
  3 rubber bulbs for pipettes.
  6 rubber bulbs for medicine dropper.
  12 feet rubber tubing, black, thin wall, $\frac{3}{16}$ inch
  6 feet rubber tubing, black, pressure, $\frac{1}{4}$ inch.
  12 feet rubber tubing, metal covered (gas connection).
  1 pair rubber gloves.
  6 rubber stoppers, each No. 0, No. 2, No. 6.
Glassware:
  2 thermometers, cent. 100°.
  2 urionometers.
  2 albuminometers (Esbach).
  2 saccharometers (Einhorn).
  2 ureometers (Doremus).
  2 burettes (plain), 50 c. c.
  1 cylinder graduate, 1,000 c. c.

Glassware—Continued.
- 2 cylinder graduates, 250 c. c.
- 2 cylinder graduates, 50 c. c.
- 2 cylinder graduates, 10 c. c.
- 2 cylinder glass stoppered, 50 c. c.
- 12 pipettes (Mohr's) graduated, 10 c. c. in $\frac{1}{10}$ c. c.
- 12 pipettes (Mohr's) graduated, 5 c. c. in $\frac{1}{10}$ c. c.
- 12 pipettes (Mohr's) graduated, 1 c. c. in $\frac{1}{100}$ c. c.
- 2 gross test tubes, thin wall, $\frac{5}{8}$ by 6 inches.
- 2 gross test tubes, culture, heavy wall, no lip, $\frac{5}{8}$ by 5 inches.
- 1 gross test tubes, medium wall, no lip, $\frac{1}{2}$ by 4 inches.
- 50 centrifuge tubes, no lip, 15 c. c.
- 6 glass funnels, 3 inches.
- 6 glass funnels, 6 inches.
- 3 glass funnels, ribbed, 6 inches.
- 2 nests beakers, usual form, 30 c. c. to 250 c. c.
- 6 flasks (Erlenmeyer) 250 c. c.
- 6 flasks (Erlenmeyer) 500 c. c.
- 6 flasks, round, flat bottom, 250 c. c.
- 6 flasks, round, flat bottom, 500 c. c.
- 6 flasks, round, flat bottom, 1,000 c. c.
- 2 washbottles, 1,000 c. c.
- 12 watch glasses, assorted, 3 to 6 inches.
- 6 gross microscope slides, medium ground, 3 by 1 inch.
- $\frac{1}{2}$ ounce cover glasses No. 1, $\frac{3}{4}$ inch.
- 2 pounds glass tubing, rods, assorted, 3 feet.
- 4 battery jars.
- 6 specimen jars (lightning), 1 pint.
- 25 petro dishes, 100 by 15 mm.
- 1 mortar and pestle (Wedgewood), 8 inches.
- 2 mortar glass pestles, 6 inches.
- $\frac{1}{2}$ pound solid glass beads.
- 9 Reagent bottles, glass stoppered, 125 c. c., labelled:
  - Sulphuric acid.
  - Nitric acid.
  - Hydrochloric acid.
  - Ammon. hydrox.
  - Alcohol.
  - Ether.
  - Sod. hydroxide.
  - Iodine solution.
- 6 Reagent bottles, plain.
- 12 dropping bottles, finger pipette, 30 c. c.

Glassware—Continued.
- 6 dropping reagent bottles, wide mouth.
- 4 glass plates, 6 by 8 inches.
- 1 glass alcohol lamp.

Chemical supplies:
- 9 pounds acid sulphuric, conc., c. p.
- 9 pounds acid hydrochloric, conc., c. p.
- 9 pounds acid nitric, conc., c. p.
- 1 pound acid acetic, glacial.
- 1 gallon alcohol, 95 per cent.
- 2 pounds ether, (anesthetic).
- 1 pound chloroform (anesthetic).
- 1 liter ammon. hydroxide, conc.
- $\frac{1}{2}$ liter xylol.
- 1 liter sodium hydroxide (normal solution).
- $\frac{1}{2}$ liter Benedict's cupric sulphate solution.
- 100 c. c. Lugol's solution (iodine).
- 1 pound phenol (cryst.).
- 100 c. c. analine oil.
- 1 pound sodium bicarbonate.
- 1 pound sodium chloride (table salt).
- 1 pound hydroxide sticks.
- $\frac{1}{2}$ pound meat extract.
- 2 ounces bromine.
- 250 gms. Fuchsine (acid).
- 100 gms. methylene blue.
- 100 gms. methyl blue.
- 50 gms. gentian violet.
- 50 gms. Bismarck brown.
- 100 gms. cedar oil.
- 1 tube Canada balsam.
- 1 tube LePage's glue.
- 10 gms. phenophthalein.
- 10 gms. potass. bichrom. (com.).
- 500 filter paper, white, 4 inches.
- 500 filter paper, white, 6 inches.
- 250 filter paper, white, 8 inches.
- 5 quires filter paper sheets, smooth, 20 by 20 inches.
- 5 pounds glycerine (pure).
- 1 pound peptone.[1]
- 1 pound agar.
- 1 pound gelatine.
- 1 pound paraffin.
- 2 ounces vaseline.
- 2 pounds cotton, cheap absorbent.
- $\frac{1}{2}$ quire gummed paper.

In addition to the necessary diagnostic work such a laboratory is a real stimulus for the members of the staff, among whom the dull routine tends to stagnation without opportunities for study.

THE TREATMENT OF SURGICAL TUBERCULOSIS.

By R. W. Hart, Passed Assistant Surgeon, United States Public Health Service.

External or surgical tuberculosis consists of tuberculosis of bones and joints, glandular tissues, genito-urinary tract, peritoneum, gastro-intestinal tract, and perirectal tissues.

The proper treatment of surgical tuberculosis requires a judicious combination of all the measures commonly employed in the treatment of pulmonary tuberculosis, as well as immobilization of the

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[1] Culture media may be purchased ready to prepare.